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REPORT ON PRIMATES
COLLECTED IN WESTERN THAILAND
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ABSTRACT

During four months of field work 152 specimens of nine species of primates were collected in western Thailand. Three species—*Macaca fascicularis, M. nemestrina, Presbytis cristatus*—are Indo-Malayan; three—*M. mulatta, M. assamensis, P. phayrei*—are Indo-Chinese; and three—*Nycticebus coucang, M. arctoides, Hylobates lar*—inhabit both faunal and subregions. Specimens collected indicate that the range of *M. nemestrina* is marginally sympatric with that of *M. assamensis,* whereas the ranges of *M. fascicularis* and *P. cristatus* appear to be allopatric with those of *M. mulatta* and *P. phayrei.* Analysis of new evidence concerning the zoogeographical and morphological inter-relationships of *M. fascicularis* and *M. mulatta* suggests that these macaques should be regarded as species instead of subspecies as previously indicated. Most encounters with the nine primate species collected were in evergreen forest, but *N. coucang, M. fascicularis,* and *M. mulatta* also were taken in groves of bamboo. Only *M. arctoides* was encountered out of the trees on the forest floor. For each species collected external measurements are given and observations are recorded on habitats, group size, stomach contents, and reproductive condition.

INTRODUCTION

During the first four months of 1967 I collected primates in Western Thailand for Field Museum of Natural History as part of a continuing program of taxonomic research that is primarily focussed on the genus *Macaca*. The expedition period in Thailand coincided with the final two-thirds of the annual dry season (northeast monsoon). Nineteen localities were visited along the Dawna Range, a mountain chain on the Thai–Burmese border (fig. 1), and a total of 152 primates of nine species were collected (Table 1). Standard dry skins and skulls were preserved routinely, and, whenever possible, stomachs with contained food material and external and internal reproductive organs were preserved in fluid. A few skeletons and undissected infants in fluid also were preserved. Notes on habitats and behavior were recorded for most primate troops observed in the course of the expedition.

The expedition party consisted of myself and two Thai associates, Mr. Pong Leng-EE and Mr. Wirot Meangmongkoon, plus local hunters, guides, and assistants temporarily employed at each collecting site as required. Until recently, the hill country in which we worked was sparsely inhabited and minimally disturbed. However, as a result of rapid expansion of the Thai population and economy, the region currently is in the process of being settled, deforested, and cultivated. Consequently, we frequently had to travel fairly long distances from main roads in order to reach suitable collecting sites. Our transportation was by jeep, Land Rover, lumber truck, motor canoe, and motor launch, depending on what was locally available and appropriate. Usually we camped in or near isolated villages, where we invariably were received with the generous hospitality for which Thai people are famous.

The expedition was financed by U. S. Public Health Service Grant No. GM 13113. Valuable advice and assistance was provided by the U. S. Department of State. In Thailand the expedition received indispensable support and assistance from the Royal Forest Department and the Applied Scientific Research Corporation, to whose officials and staff members I am deeply grateful. Special thanks are due my field companions Mr. Pong Leng-EE of the Royal

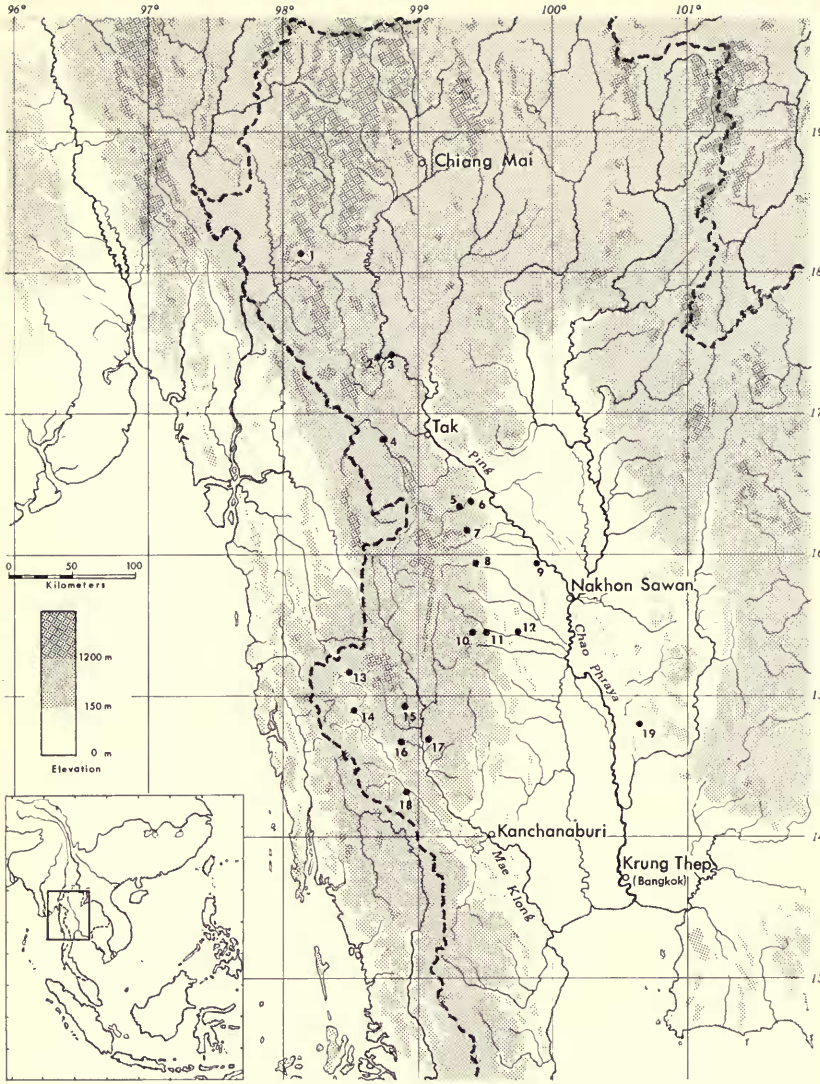


FIG. 1. Map of western Thailand showing location of collecting localities. CHANGWAT (=province) MAE HONG SONG: 1—Mae Sariang, about 30 km. E (collected by Dr. G. Berkson); CHANGWAT TAK: 2—Huai Ap Nang, 3—Huai Kwang Pah (left bank Mae Nam Ping) and Huai Wang Kwao (right bank Mae Nam Ping), 4—Ban Mae Lamao; CHANGWAT KAMPHAENG PHET: 5—Ban Pong Nam Ron, 6—Ban Mae Na Ree, 7—Ban Nam Lai Tai, 8—Ko Keow; CHANGWAT NAKHON SAWAN: 9—Khao Naw; CHANGWAT UTHAI THANI: 10—Kata Taek, 11—Samnak Rabam, 10 km. SE, 12—Khao Phatowee; CHANGWAT KANCHANABURI: 13—Ban Kerng Chada, 14—Ban Tamrong Phato, 15—Ban Muang Baw Ngam, 16—Chongkrong, 17—Ban Phu Toei, 18—Ban Huai Maenam Noi; CHANGWAT LOP BURI: 19—Lop Buri.

Forest Department, who made important contributions to the planning of all phases of the expedition, and Mr. Wirot Meangmongkoon, who served diligently as chief field assistant, hunter, and interpreter.

In species accounts in this report some specimens collected in Thailand are compared with specimens preserved in the museums listed below; names of museums are abbreviated as indicated. I thank curators of these institutions for permission to study material in their custody.

AMNH.—American Museum of Natural History, New York
BMNH.—British Museum (Natural History), London
FMNH.—Field Museum of Natural History, Chicago
MCZ.—Museum of Comparative Zoology, Harvard University, Cambridge
MNHN.—Muséum National d'Histoire Naturelle, Paris
USNM.—United States National Museum, Washington, D. C.

TABLE 1.—Species and localities of primate specimens collected; for key to locality numbers see Figure 1.

Species	Number of specimens of each species collected at indicated locality — Locality No.																
	1	2	3	4	5	6	7	8	10	11	13	14	15	16	17	18	Total
Nycticebus coucang				1		3											4
Macaca fascicularis						3	8		6			8			2	2	29
M. mulatta		1	2	1													4
M. nemestrina					6			1		2	4			1		7	21
M. assamensis				3	8			1					4	2			18
M. arctoides													1	3			4
Presbytis cristatus											4	3				4	11
P. phayrei			5	6	1			1	11				5	3			32
Hylobates lar	2		2	3	3		1	4	4		1	2	3	4			29
Total	2	1	9	14	18	6	9	7	21	2	9	13	13	13	2	13	152

ZOOGEOGRAPHY AND ECOLOGY

Western Thailand is an area of special zoogeographic importance in the Oriental faunal region because it is in or near the zone of transition between the subtropical Indo-Chinese subregion and the tropical Indo-Malayan subregion (Pocock, 1939, p. xxiii; Chasen, 1940, p. x). This subregional faunal transition is manifest in the distribution of six of nine primate species collected by the expedition. *Macaca mulatta, M. assamensis,* and *Presbytis phayrei* are Indo-Chinese species, and *M. fascicularis, M. nemestrina,* and *P. cristatus* are the respective Indo-Malayan counterparts. In the zone of transition in western Thailand, expedition collecting results indicate that *M. mulatta* and *M. fascicularis* are allopatric, *M. assamensis* and *M. nemestrina* are marginally sympatric, and *P. phayrei* and *P. cristatus* are allopatric (Table 1).

Although borders between the ranges of these three pairs of species are in the same general area in western Thailand, these borders apparently do not coincide precisely. In Indo-Chinese species, the known ranges of *M. assamensis* and *P. phayrei* extend south as far as Chongkrong (14°41′N), whereas the range of *M. mulatta* apparently does not extend south beyond the vicinity of Ban Umphang (approx. 16°00′N; Fooden, 1964, p. 363). In Indo-Malayan species, the known range of *P. cristatus* extends north to Ban Kerng Chada (15°08′N), that of *M. fascicularis* extends to Ban Mae Na Ree

TABLE 2.—Forest types in which primate troops were encountered; for details see *Species Accounts.*

Species	Forest type		
	Deciduous	Bamboo	Evergreen
Nycticebus coucang	0	1	1
Macaca fascicularis	1–2	5	4–6
M. mulatta	0	2	1
M. nemestrina	1	0	8
M. assamensis	0	2	8
M. arctoides	0	0	2
Presbytis cristatus	0	0	5
P. phayrei	0	0	9
Hylobates lar	0	0	19

TABLE 3.—Food material in stomachs and cheek pouches of primate species collected; ++indicates major component, +indicates minor component; for details see *Species Accounts*.

Species	Stomachs examined	Contents of stomachs and cheek pouches: Leaves	Fruit, seeds	Invertebrates	Vertebrates
Nycticebus coucang	2		++	+	
Macaca fascicularis	28		++	+	
M. mulatta	3		++		+
M. nemestrina	7		++	+	
M. assamensis	10		++	+	+
M. arctoides	4		++		
Presbytis cristatus	4	++			
P. phayrei	5	++			
Hylobates lar	21		++		

(16°25′N), and that of *M. nemestrina* extends to Khun Tan (18°35′N; Gyldenstolpe, 1917, p. 7).

Forest types in which the nine primate species collected were observed are indicated in Table 2. All species occur in evergreen trees, and four were observed in no other habitat. Bear macaques (*Macaca arctoides*), two species of langurs (*Presbytis cristatus, P. phayrei*), and gibbons (*Hylobates lar*) were encountered exclusively in evergreen forest. Almost all encounters with Assamese and pigtail macaques (*M. assamensis, M. nemestrina*) also were in evergreen forest; however, *M. assamensis* was encountered twice in groves of bamboo, and *M. nemestrina* was encountered once in deciduous trees. Slow lorises (*Nycticebus coucang*), crab-eating macaques (*M. fascicularis*), and rhesus macaques (*M. mulatta*) appear to be least restricted to evergreen forest; all were encountered in bamboo forest approximately as often as in evergreen forest, and *M. fascicularis* also was encountered twice in deciduous forest. Botanical characterizations of habi-

TABLE 4.—Probable month of birth estimated for fetuses (F) and infants (I) of primate species collected; for details see *Species Accounts*.

Species	Estimated month of birth: Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
Macaca fascicularis								F,I	F,F	F		
M. nemestrina						I,I					F	F
M. assamensis									F	F	F,F	
Presbytis cristatus					I				F	F		
P. phayrei	I,I		I				I					
Hylobates lar				I	I,I							

tats in some areas visited during the present expedition and in similar areas in neighboring parts of Thailand have been published by Larsen (1962, p. 110) and Tem Smitinand (1968, p. 289).

Specimens of most sympatric species were collected—frequently on the same day—at points so close together that it seems highly probable that these species pass through the same trees in the course of their normal activity. Although *M. fascicularis* and *M. nemestrina* are broadly sympatric, these two macaques may be ecologically segregated, judging from the rarity of their concurrent collection (Table 1). Of primate species collected, only *M. arctoides* appears to spend much time on the ground (see *Species Accounts* and McCann, 1933, p. 807).

Major categories of food material contained in the stomachs and cheek pouches of primate species collected are summarized in Table 3. Preliminary analysis of preserved stomach contents indicates that all seven frugivorous species frequently fed on the same kinds of fruit.

Evidence of seasonal breeding that is provided by the estimated ages of fetuses and infants collected by the expedition is summarized in Table 4.

ITINERARY AND LOCALITY NOTES

December 26, 1966—Left Chicago.

December 29, 1966–January 9, 1967—Bangkok (=Krung Thep).

January 11–23—Ban Muang Baw Ngam, 14°55′N, 98°55′E, alt. approx. 1,100 m. (fig. 1, Loc. No. 15). This lead and zinc mining camp in the highlands between Mae Nam Khwae Yai (=Mae Nam Mae Klong) and Mae Nam Khwae Noi has a resident population of about 100, including miners and their families. The shallow subsurface ore deposits are worked by means of small manually-excavated open pits. The terrain is hilly with numerous steep rocky outcrops. Dense evergreen forest interspersed with groves of bamboo covers the hills (Plate I,a). All specimens were collected within a half day's walk of camp. The temperature at Ban Muang Baw Ngam was markedly cooler than at any other collecting locality visited (Table 5).

January 26–29—Chongkrong, 14°41′N, 98°52′E, alt. 600–900 m. (fig. 1, Loc. No. 16). This is a small intermittently occupied lumber camp about 17 km. west of Si Sawat (see below) and about 25 km. south of Ban Muang Baw Ngam (see above). The terrain is somewhat less rugged than at Ban Muang Baw Ngam, but the evergreen and bamboo forest is essentially similar. All specimens were taken within two or three hours' walk of camp.

January 30–February 1—Si Sawat, 14°41′N, 99°02′E, alt. ap-approx. 50 m. This village of about 100 houses is on the right bank of Mae Nam Khwae Yai about 90 km. upstream from Kanchanaburi, the provincial capital. The village is the district government headquarters. It is surrounded by cultivated fields and low hills covered with deciduous and bamboo forests. Local residents informed us that long-tailed macaques (*M. fascicularis*) in the area are restricted to the east (left) bank of the river. Accordingly, we sent one of our hunters on an overnight collecting trip to Ban Phu Toei (fig. 1, Loc. No. 17), a small settlement about 8 km. northeast of Si Sawat, where

TABLE 5.—Temperature extremes at collecting localities visited.

Collecting locality	Date (1967)	Night-time lows	Day-time highs
Ban Muang Baw Ngam	Jan. 11–22	44–57°F	74–79°F[1]
Chongkrong	Jan. 26–29	63–66	88–91
Si Sawat	Jan. 30–Feb. 1	65–66	91–97
Ban Kerng Chada	Feb. 4–8	53–63	86–89
Ban Tamrong Phato	Feb. 9–13	60–63	92–93
Ban Huai Maenam Noi	Feb. 14–18	58–62	86–88
Kata Taek	Feb. 27–March 3	65–68	84–93
Ko Keow	March 5–10	65–71	88–92
Ban Mae Na Ree	March 13–15	66–68	96
Ban Mae Lamao	March 17–26	62–66	92–95
Huai Kwang Pah	March 28–30	62–76	92–93
Ban Nam Lai Tai	April 1–6	68–73	97–99
Ban Pong Nam Ron	April 8–15	69–74	95–103
Khlong Suan Mak	April 20–24	73–76	88–90

[1] Excludes exceptional high of 87°F recorded on Jan. 22.

the hunter obtained two specimens of *M. fascicularis* in bamboo forest along a nearby creek (Huai Ong Sit).

February 2–3—Ban Wang Kalang (=Sangkhla Buri), 15°06′N, 98°28′E, alt. approx. 100 m. This large village near the headwaters of Mae Nam Khwae Noi is the district government headquarters. On a hunting trip about 10 km. downstream from Ban Wang Kalang we encountered a troop of about 20 *M. fascicularis* in bamboo forest along the bank of a small western (right) affluent of Mae Nam Khwae Noi, but we were unable to collect specimens. During the return trip upstream, from our boat we observed a second troop of monkeys (probably also *M. fascicularis*) in another bamboo grove on the right bank of Mae Nam Khwae Noi.

February 4–8—Ban Kerng Chada, 15°08′N, 98°31′E, alt. ap- approx. 150 m. (fig. 1, Loc. No. 13). This Karen village has a population of about 150 and is about 10 km. east of Ban Wang Kalang (see above) on the right bank of Mae Nam Ran Ti, one of the headwaters of Mae Nam Khwae Noi. Ban Kerng Chada is in the foothills of a mountain range that reaches a peak of 1,805 m. about 25 km. to the northeast of the village. The hills are covered with evergreen forest interspersed with occasional groves of bamboo. All specimens were taken within a half day's walk of the village.

February 9–13—Ban Tamrong Phato (=Ban Wang Phato), 14°54′N, 98°31′E, alt. approx. 100 m. (fig. 1, Loc. No. 14). This village of about 80 houses is on the west (right) bank of Mae Nam Khwae Noi about 25 km. downstream from Ban Wang Kalang (see

above). The village is surrounded by cultivated fields, with evergreen and bamboo forests on the hills beyond. Seven crab-eaters (*M. fascicularis*) were taken within two hours' walk of the village in evergreen trees near the river; two gibbons and one crab-eater were taken about a half day's walk from the village; and three langurs were taken on an overnight hunting trip to Phapung, about 10 km. from Ban Tamrong Phato.

February 9–13—Ban Huai Maenam Noi, 14°25′N, 98°51′E, alt. approx. 75 m. (fig. 1, Loc. No. 18). This village consists of about 10 houses built on rafts moored to both banks of Mae Nam Kwai Noi about 75 km. northwest of Kanchanaburi, the provincial capital. The flat land near the river banks is under cultivation. Beyond the fields are low hills covered with evergreen and bamboo forest. Our hunters made several half-day trips by boat and lumber truck in order to collect on both banks of the river upstream and downstream from the village. Local residents informed us that the forests in which we hunted around Ban Huai Maenam Noi are the southernmost remaining monkey habitats on Mae Nam Khwae Noi.

February 19–23—Bangkok.

February 24—Lop Buri, 14°48′N, 100°37′E, alt. approx. 25 m. (fig. 1, Loc. No. 19). This town is a provincial capital about 120 km. north of Bangkok. It is traversed by the Bangkok–Chiang Mai highway. A colony of 100–200 long-tailed macaques (*M. fascicularis*) inhabits the ruins of an old Buddhist temple that are preserved on a traffic island in the center of town (Plate II,a). The monkeys are fearless and well fed by resident monks and crowds of devout visitors. Temple custodians believe that this colony is descended from wild monkey populations that inhabited the Lop Buri area 50 or 60 years ago when the region was densely forested. I know of no reason to doubt this explanation of the colony's origin. Today, the nearest populations of wild monkeys probably are at Khao Yai National Park, about 100 km. southeast of Lop Buri.

February 25—Khao Phatowee, 15°28′N, 99°45′E, alt. approx. 50 m. (fig. 1, Loc. No. 12). This sacred hill is an isolated limestone crag that rises about 100 m. above the rice fields of the surrounding plain (Plate I,b,c). The hill, which is riddled with caves and overgrown with shrubs and trees, is inhabited by a colony of 100–200 long-tailed macaques (*M. fascicularis*). As at Lop Buri (see above), local residents believe that the Khao Phatowee monkey colony is a

relict of wild populations that inhabited extensive forests that existed in the area up to about 40 years ago, before the onset of intensive cultivation.

February 26—Samnak Rabam, 15°31′N, 99°29′E. alt. approx. 150 m. Enroute to Kata Taek (see below), about noon from our truck we spotted a troop of pigtail macaques (*M. nemestrina*) in a stretch of evergreen forest along the trail approximately 10 km. southeast of the village of Samnak Rabam. We dismounted and pursued the troop into the forest, and succeeded in collecting two specimens (fig. 1, Loc. No. 11).

February 27–March 3—Kata Taek, 15°28′N, 99°23′E, alt. approx. 200 m. (fig. 1, Loc. No. 10). This is a small seasonally occupied dipterocarp resin-collecting camp on the left bank of a narrow creek about 10 km. southwest of Samnak Rabam (see above). The camp is surrounded by hills covered with mixed evergreen-deciduous-bamboo forest in which relatively low trees, up to about 20 m. tall, predominate. All specimens were collected within three hours' walk of camp.

March 5–10—Ko Keow, 15°57′N, 99°26′E, alt. approx. 200 m. (fig. 1, Loc. No. 8). This large lumber camp is a few kilometers north of the upper Nam Mae Wong in the foothills of the Dawna Range. Approximately 100 workers are employed in intensive logging operations that began here about 10 years ago. The immediate vicinity of the camp is now farmland with a few scattered relicts of evergreen forest. In 1924 crab-eating macaques (*M. fascicularis*) were collected here for the American Museum of Natural History by A. S. Vernay. Although local residents report that *M. fascicularis* was common along the river up to about 20 years ago, these monkeys apparently no longer exist in the vicinity. Our hunters traveled by lumber truck within a radius of 10–15 km. of Ko Keow and collected four gibbons, one langur, one pigtail macaque, and one Assamese macaque.

March 11—Khao Naw, 15°59′N, 99°51′E, alt. approx. 75 m. (fig. 1, Loc. No. 9). This sacred hill is an isolated peak surrounded by farmland. The hill, which is 42 km. northwest of Nakhon Sawan and about 1 km. east of the Bangkok–Chiang Mai highway, is covered with evergreen forest and is inhabited by a semi-domesticated colony of long-tailed macaques (*M. fascicularis*) estimated to number 300 individuals. The monkeys are fed by Buddhist monks who maintain a temple at the foot of the hill. I observed the monkeys

assemble for food (boiled rice) at the sound of a gong that was rung by one of the monks. A Buddhist shrine in a cave half-way up the hill has been in existence for at least 100 years, and, according to tradition, monkeys have inhabited the hill throughout this period.

March 13–15—Ban Mae Na Ree, 16°25′N, 99°23′E, alt. approx. 150 m. (fig. 1, Loc. No. 6). This village of approximately 50 houses on the right bank of Khlong Suan Mak was established about two years ago by migrants from a northern area flooded by the Yan Hee Dam. Formerly the Ban Mae Na Ree region was covered by evergreen forest, but now most of the land is under cultivation and the forest is reduced to a 2×5 km. tract along the stream. All specimens were collected in this small relict tract of evergreen forest.

March 17–26—Ban Mae Lamao, 16°48.5′N, 98°45.0′E, alt. approx. 350 m. (fig. 1, Loc. No. 4). This large village of about 200 houses is in the mountains between Tak and Mae Sot on the right bank of Huai Mae Lamao, a stream that flows northwestward to join the Salween River on the border between Thailand and Burma. The village is surrounded by cultivated fields. About three hours' walking distance (10–15 km.) to the south and west of the village are forested hills where our hunters collected five species of primates. At lower elevations in these hills deciduous dipterocarp forest predominates; at higher elevations this is largely replaced by broadleaf evergreen forest; and on some of the highest ridges there are stands of pine. Interspersed at all elevations are restricted or extensive groves of bamboo. In April–July, 1924 K. G. Gairdner collected gibbons, langurs, and macaques about 20 km. northeast of Ban Mae Lamao (Chasen and Kloss, 1930, p. 63).

March 28–30—Huai Kwang Pah and Huai Wang Kwao, 17°28′N, 98°50′E, alt. approx. 300 m. (fig. 1, Loc. No. 3). Huai Kwang Pah is a southward flowing creek that joins Mae Nam Ping (left bank) about 25 km. above the Yan Hee Dam. At the mouth of Huai Kwang Pah is a small settlement consisting of two or three bamboo huts. Huai Wang Kwao is a seasonally dry creek on the opposite (right) bank of Mae Nam Ping 1 or 2 km. upstream from Huai Kwang Pah. As a result of recent construction of the Yan Hee Dam, Mae Nam Ping is artificially broadened in this area, and the hills now rise abruptly on both sides of the river. The hill forests near the river are mixed bamboo and deciduous; higher on the hills,

1 or 2 km. inland, tall evergreen trees predominate. In the vicinity of Huai Kwang Pah we collected two gibbons, two langurs, and two rhesus macaques, and near Huai Wang Kwao we obtained three langurs. Another party of our expedition hunters collected one rhesus macaque at Huai Ap Nang (fig. 1, Loc. No. 2), a creek about 10 km. upstream (right bank) from Huai Kwang Pah.

April 1–6—Ban Nam Lai Tai, 16°10′N, 99°20′E, alt. approx. 300 m. (fig. 1, Loc. No. 7). This village of about 75 houses is 1–2 km. west of Nam Lai (right bank) one of the headwaters of Khlong Klung. The village, which was established about five years ago, is surrounded by a cleared and cultivated area that formerly was covered with evergreen forest (Plate II,b). Expedition hunters collected one gibbon and eight crab-eating macaques (*M. fascicularis*) in evergreen forest on the foothills of the Dawna Range about 5 km. west of Ban Nam Lai Tai. In July, 1949 Colin Sanborn (1952, p. 7) collected one pigtail macaque and two langurs in this same general area along the upper Khlong Klung.

April 8–15—Ban Pong Nam Ron, 16°20′N, 99°18′E, alt. approx. 200 m. (fig. 1, Loc. No. 5). This village of about 100 houses is on the left bank of Khlong Suan Mak a few kilometers east of the foothills of the Dawna Range. The foothill forests, where all of our specimens were taken, are bamboo and evergreen at lower elevations and predominantly evergreen higher up. Three gibbons, one langur, and one pigtail macaque (*M. nemestrina*) were taken at elevations of 200–300 m. within five hours' walk west of the village. On a long overnight hunting trip four specimens of *M. assamensis* were taken about 25 km. west of the village at approximately 750 m. elevation.

April 16–17—Bangkok.

April 18—Lop Buri; repeat visit to temple ruins to re-examine resident colony of *M. fascicularis* (see above).

April 20–24—Khlong Suan Mak (2 km. west of Ban Pong Nam Ron), 16°20′N, 99°17′E, alt. approx. 200 m. On our return visit to the Ban Pong Nam Ron area (see above) we camped about 2 km. west of the village on the left bank of Khlong Suan Mak immediately at the base of two 100 m. high foothills of the Dawna Range (Plate III,a,b). One *M. assamensis* specimen was collected about 3 km. west of camp; three *M. nemestrina* specimens and three *M. assamensis* specimens were collected on successive days about 6 km. west of camp, and two *M. nemestrina* specimens were collected about

10 km. west of camp. The altitudes of these collection points range up to about 250 m.

April 25–28—Bangkok. Before leaving Thailand I received from Dr. Gershon Berkson two gibbon specimens that he collected on March 12, 1967 in evergreen forest about 30 km. east of Mae Sariang (18°19′N, 98°07′E; fig. 1, Loc. No. 1).

April 30, 1967—Arrived Chicago.

SPECIES ACCOUNTS

Nycticebus coucang (Boddaert). Slow Loris.

Tardigradus Coucang Boddaert, 1784 [1785], p. 67—lectotype, the tailless Maucauco: Pennant, 1781, tab. 26, designated by Thomas, 1922, p. 433.

Four slow lorises were taken at two localities incidental to the collection of other primates. There was no systematic program of night hunting for slow lorises. Each of the two localities is represented by a different nominal subspecies of *N. coucang*.

Measurements.—See Table 6.

Nycticebus coucang bengalensis (Fischer).

Loris bengalensis Fischer, 1804, Anat. Maki, p. 30 (work not seen; citation from Pocock, 1939, p. 166).

Specimens collected.—TAK: Ban Mae Lamao, 1.

Habits and habitats.—This solitary adult female was collected alive about 10 m. above the ground in an evergreen tree. The animal was not pregnant, judging from gross examination of the opened uterus. The stomach contained whitish vegetable matter and hairs which match those of the animal's own fur. The hairs presumably were ingested as a result of self-grooming with the mandibular dental comb. Ingested hair that is inferred to be the result of using the teeth for grooming also has been found in the stomachs of African prosimians, *Euoticus elegantulus* and *Galago demidovii*, by Jewell and Oates (1969, p. 245). The intestine of this slow loris contained parasitic nematodes.

Nycticebus coucang tenasserimensis Elliot.

Nycticebus tenasserimensis Elliot, 1912 [1913], vol. 1, p. 25.

Specimens collected.—KAMPHAENGPHET: Ban Mae Na Ree, 3 (1 infant in alcohol).

Habits and habitats.—These three specimens (adult male, adult female, infant female with complete deciduous dentition) constituted a family group collected together about 5 m. above the ground in a clump of bamboo. The adult female was pregnant with an early embryo. The stomach of the adult male contained insect fragments and fragments of purplish fruit.

TABLE 6.—External measurements in adult specimens of *Nycticebus coucang.*

	Head and body (mm.)	Relative tail length[2]	Weight (kg.)
Females			
Locality:[1]			
Mae Na Ree (**6**)	335	0.05	0.90
Males			
Locality:			
Mae Lamao (**4**)	345	0.04	0.85
Mae Na Ree (**6**)	344	0.10	0.92

[1] Figures in boldface type are locality numbers shown on map, Figure 1.
[2] Tail length ÷ head and body length.

Remarks.—This weakly defined subspecies is geographically and morphologically intermediate between Indo–Malayan *N. c. coucang* and Indo–Chinese *N. c. bengalensis,* as previously noted by Pocock (1939, p. 170). In. *N. c. coucang* (FMNH 98478, Malaya) a dark mid-dorsal band extends from the lumbar region to the crown and continues anteriorly and laterally as four dark streaks which connect with dark rings around the eyes and ears. In. *N. c. bengalensis* (Ban Mae Lamao; see above) the mid-dorsal band is paler and it extends forward only to the occiput, so that the crown is whitish and the dark rings around the eyes and ears are isolated. In. *N. c. tenasserimensis,* which is the intermediate subspecies, the mid-dorsal band narrows anteriorly and the four streaks leading to the eyes and ears are indistinct. Future revisory study may demonstrate that the range of variation in *N. c. coucang* should be extended to include diagnostic characters assigned to *N. c. tenasserimensis,* which would sink the latter nominal subspecies into the synonymy of the former. In this case, the geographic border between the Indo–Chinese range of *N. c. bengalensis* and the extended Indo–Malayan range of redefined *N. c. coucang* would coincide almost precisely with the border between the ranges of *Macaca mulatta* and *M. fascicularis* (see below).

Macaca fascicularis (Raffles). Crab-eating, Kra or Long-tailed Macaque.

Simia fascicularis Raffles, 1821, p. 246—for validity of this name, see Fooden, 1964, p. 365, footnote 2.

Specimens collected.—KANCHANABURI: Ban Tamrong Phato, 8; Ban Huai Maenam Noi, 2; Ban Phu Toei, 2. UTHAI THANI: Kata Taek, 6 (1 skeleton). KAMPHAENG PHET: Ban Nam Lai Tai, 8 (1 in alcohol); Ban Mae Na Ree, 3 (1 skeleton).

TABLE 7.—External measurements in adult specimens of *Macaca mulatta* and *Macaca fascicularis*.

Locality[1]	Females			Males		
	Head and body (mm.)	Relative tail length[2]	Weight (kg.)	Head and body (mm.)	Relative tail length[2]	Weight (kg.)
Macaca mulatta						
Huai Ap Nang (**2**)	—	—	—	492	0.48	6.2
Mae Lamao (**4**)	420	0.57	3.00	—	—	—
Macaca fascicularis						
Mae Ma Ree (**6**)	407, 424	0.96, 0.79	3.56, 3.80	448[3]	0.85	4.55[3]
Nam Lai Tai (**7**)	354,409,425[4]	1.10,1.15,0.96	2.95,3.43,3.97[4]	—	—	—
Kata Taek (**10**)	376[5]	0.94	3.37[5]	434	1.05	5.49
Tamrong Phato (**14**)	426,[4]448,[4]486	1.06,1.14,0.91	3.93,[4]3.88,[4]4.72	529	1.04	6.1

[1] Figures in boldface type are locality numbers shown in map, Figure 1.
[2] Tail length ÷ head and body length.
[3] Subadult, canines not quite fully erupted.
[4] Subadult, last molars incompletely erupted.
[5] Subadult, last molars not erupted.

Sight records (see *Itinerary and Locality Notes*).—KANCHANABURI: Mae Nam Khwae Noi, right bank, about 10 km. below Ban Wang Kalang, 2 troops, Feb. 3, 1967. LOP BURI: Lop Buri, protected colony, Feb. 24 and April, 18, 1967 (Plate II,a). UTHAI THANI: Khao Phatowee, protected colony, Feb. 25, 1967. NAKHON SAWAN: Khao Naw, protected colony, March 10, 1967.

Measurements.—See Table 7.

Habits and habitats.—Troops of *M. fascicularis* were encountered with approximately equal frequency in bamboo and evergreen trees, and one or two troops also were encountered in deciduous dipterocarp trees (Table 8). Troop size varied from about seven to 100. Solitary individuals were encountered twice (one pregnant female, FMNH 99641; one adult male, FMNH 99651). In all specimens examined recognizable stomach contents consist exclusively of fruit pulp and seeds. However, the cheek pouches of one adult female (FMNH 99645) were stuffed with small dark unidentified snails.

Five females collected between February 10 and March 3 were in various stages of pregnancy (estimated one to three months before term), and no visibly pregnant females of *M. fascicularis* were collected thereafter (Table 9). The uteri of three females collected on April 4–5 apparently were undergoing post-partum involution; two of these were lactating and one was collected with a very young infant. A total of four lactating nonpregnant females, including two with young infants, was collected between March 14 and April 5. These observations suggest that *M. fascicularis* in Thailand has a birth peak in the period March–May.

Pregnancy in lactating females evidently is not uncommon in *M. fascicularis* living under natural conditions (Table 9, FMNH 99644, 99645), as predicted by Spiegel (1954, p. 261), who observed continuous lactation through successive births in captive animals. The precocious pregnancy of a juvenile female (Table 9, FMNH 99646) estimated from dental evidence to be about three years old appears to be unusual in *M. fascicularis* (Spiegel, 1954, p. 230).

Remarks.—The geographical and morphological inter-relationships of crab-eating macaques and rhesus macaques in the Indo–Chinese Peninsula are of special taxonomic and evolutionary interest. Previously, I presented evidence of morphological intergradation that tended to show that these two macaques are conspecific (Fooden, 1964, p. 363). This was in contrast to earlier usual allocation of these monkeys to separate subgenera. Further information is now avail-

TABLE 8.—Field observations of troop size and habitats in *Macaca fascicularis*.

Date, 1967	Locality	Estimated number in troop	Kind of tree in which observed	Estimated height above ground (m.)
Jan. 31	Phu Toei	20	bamboo	20
Feb. 3[1]	Wang Kalang, 10 km. S	20	bamboo	5–10
Feb. 10	Tamrong Phato	1	bamboo	?40
Feb. 11	Tamrong Phato	20	evergreen	20
Feb. 16	Maenam Noi, SE	100	evergreen	10
Feb. 17	Maenam Noi, NW	90	evertreen	30
March 2	Kata Taek	1	bamboo	top of clump
March 3	Kata Taek	30	bamboo	20
March 13	Mae Na Ree	15	deciduous dipterocarp	30
March 14	Mae Na Ree	12[2]	deciduous dipterocarp	10
April 4	Nam Lai Tai	15	evergreen	?60
April 5	Nam Lai Tai	10[2]	evergreen	?60
April 5	Nam Lai Tai	7[3]	evergreen	?50

[1] Sight record; no specimens collected.
[2] Probably same troop as one listed immediately preceding in table.
[3] Possibly same troop as one listed immediately preceding in table.

TABLE 9.—Reproductive data in *Macaca fascicularis* females collected.

FMNH No.	Date (1967)	Dental development[1]	Reproductive condition[2]	Uterus, length × breadth × d-v diam. (mm.)
99641	Feb. 10	M 3 erupting	Pregnant; sitting height of fetus 125 mm. (est. age 3½ mos.)	135 × 80 × 55
99644	Feb. 11	M 3 worn	Pregnant, lactating; sitting height of fetus 100 mm. (est. age 3 mos.)	110 × 80 × 50
99645	Feb. 11	M 3 erupting	Pregnant, lactating; sitting height of fetus 140 mm. (est. age 4 mos.)	150 × 80 × 50
99646	Feb. 11	Dec. C, I 1–2; perm. M 2 erupting; est. age 3 yrs.	Pregnant; sitting height of fetus 80 mm. (est. age 2½ mos.)	110 × 55 × 45
99654	March 3	Perm. C, M 2	Pregnant; sitting height of fetus 150 mm. (est. age 4½ mos.)	150 × 80 × 60
99655	March 3	Perm. I 1, M 1; est. age 2½ yrs.	Not pregnant; immature	25 × 13 × 6
99656	March 3	Perm. M 1; est. age 2 yrs.	Not pregnant; immature	20 × 9 × 4
99658	March 14	M 3 worn	Lactating; with infant (not collected)	40 × 18 × 8
99659	March 14	M 3 unworn	Lactating	40 × 17 × 8
99660	April 3	M 3 unworn	Not pregnant	35 × 15 × 8
99661	April 4	M 3 slightly worn	Not pregnant	60 × 33 × 15[3]
99663	April 5	M 3 erupting	Lactating, with infant[4]	65 × 30 × 18[3]
99665	April 5	M 3 slightly worn	Lactating	50 × 20 × 11[3]
99666	April 5	Dec. C, M 1–2; perm. M 2; est. age 3 yrs.	Not pregnant	28 × 12 × 5
99667	April 5	Perm. C, M 2	Not pregnant	30 × 13 × 8

[1] Age estimates of juveniles based on Hurme, 1960, p. 797.

[2] Conception age estimates of fetuses based on Schultz's (1937, p. 77) study of prenatal development in *M. mulatta*, which is somewhat larger than *M. fascicularis*.

[3] No blastocyst grossly visible in uterine cavity; probably an early stage of post-partum involution (Hartman, 1932, p. 67).

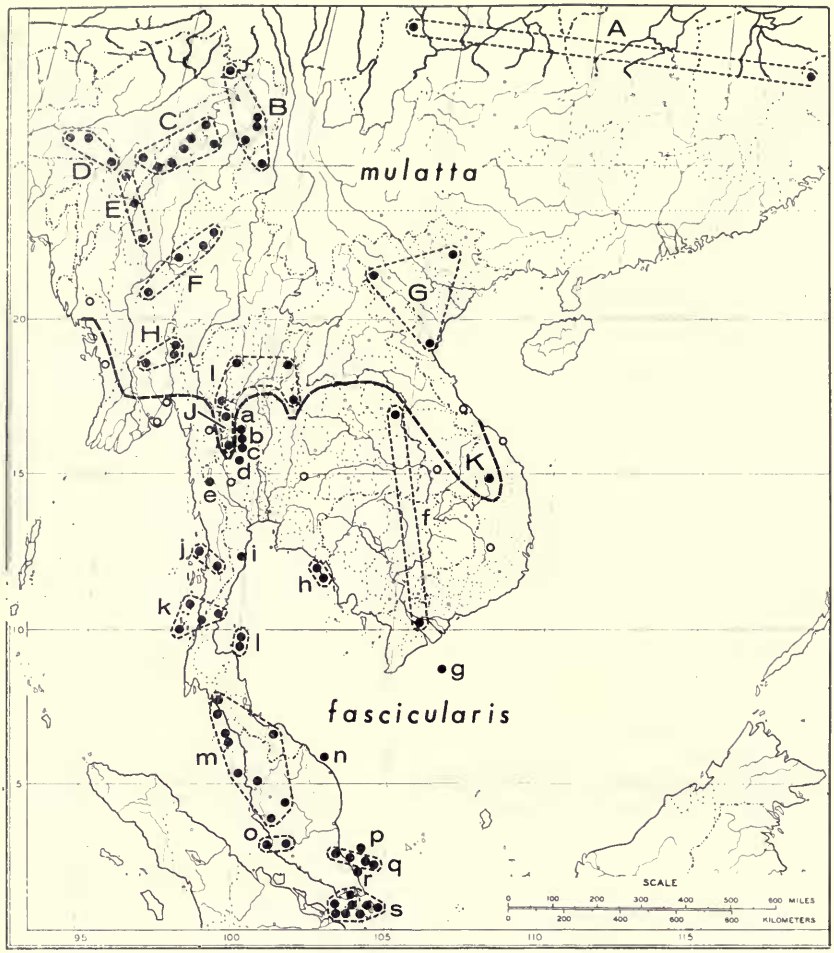
[4] Infant with deciduous I 1 erupting and sitting height 165 mm.; estimated age less than one month.

able from study of additional museum specimens and from study of specimens that were collected in Thailand with this specific problem in mind. As discussed below, the available evidence no longer appears adequate to establish that crab-eating and rhesus macaques are conspecific.

The distribution of crab-eating macaques is broadly Indo–Malayan, extending from Timor and the Philippine Islands westward and northward to southern Burma. The complementary, more northern distribution of rhesus macaques is broadly sub-Himalayan, extending from southern China westward to easternmost Afghanistan. The border between the ranges of these monkeys extends irregularly across the Indo–Chinese Peninsula approximately 1,500 km. from Akyab, Burma, to Húe, South Vietnam (fig. 2). Along this irregular front, which coincides with the margin of the mountain chains that extend southeastward from the Himalayas, crab-eating macaques inhabit low elevations up to about 500 m., and rhesus macaques inhabit higher altitudes. Although both monkeys are now absent from large parts of their former ranges as a result of progressively intensifying human activity, the pattern of complementarity remains clear (fig. 2).

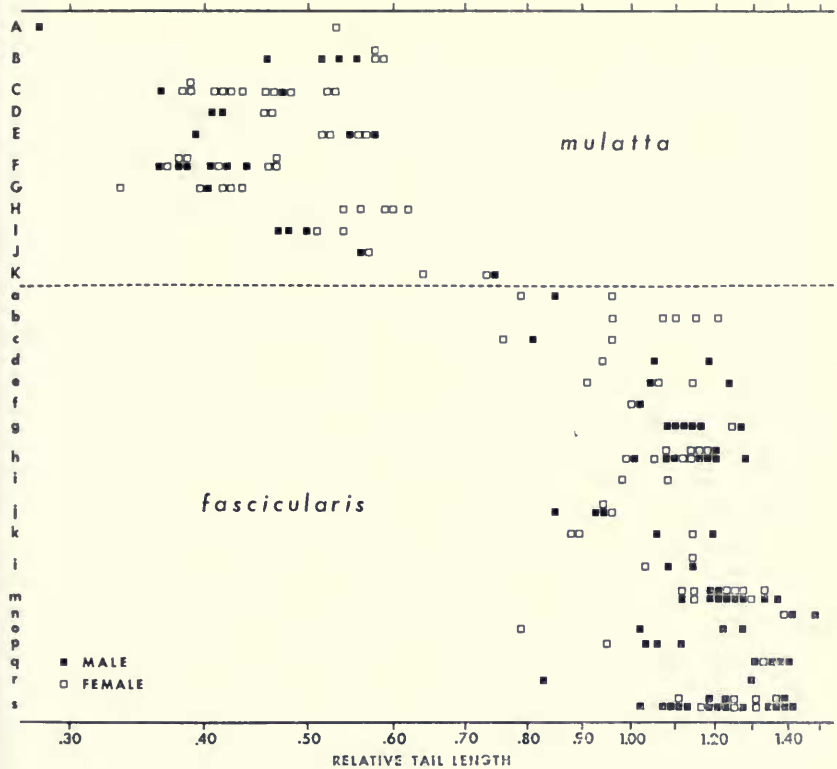
The most conveniently analyzed taxonomic character that distinguishes crab-eating macaques from rhesus macaques is relative tail length (tail length ÷ head and body length; flesh measurements). This proportion is comparable in adults and subadults with permanent premolars. It is not directly comparable in younger monkeys because relative tail length decreases ontogenetically up to about age four years, when permanent premolars erupt (Schultz, 1933, pp. 18, 23). Individual and local variation of relative tail length in crab-eating macaques and rhesus macaques is graphed in Figure 3, which includes all proportions known from flesh measurements for adults and subadults collected north of the Strait of Malacca and east of the Brahmaputra River.

There is no apparent overlap in the relative tail length of rhesus macaques and crab-eating macaques (fig. 3). In the broad area shown in Figure 2, excluding three marginal localities discussed below, relative tail length varies from 0.34 to 0.61 in rhesus macaques and from 0.79 to 1.48 in crab-eating macaques. Similar limits of variation also apply in specimens examined from more distant parts of the ranges of these monkeys. For example, in eight rhesus macaques collected in Kashmir, about 2,000 km. west of the area studied, relative tail length varies from 0.32 (USNM 173812 ♀) to 0.48 (USNM 353187 ♀);



FIGS. 2, 3. Map showing distribution of *Macaca mulatta* and *M. fascicularis* in Southeast Asia, and graph showing variation of relative tail length. Sample areas of *M. mulatta* are designated by capital letters on map and graph; those of *M. fascicularis* are designated by small letters.

Closed circles indicate localities from which adult and subadult specimens with external measurements are available, as follows: *M. mulatta*: A—Chungan Hsien (AMNH); 30 km. SW of Kiating (BMNH). B—Dening, Bawmwang, Htingnan, N'changyang (BMNH); Teng Yueh (MCZ). C—Dalu-Taga Hka, Nanyaseik, Hkampti-Heinsum, Moklok, Maungkan (AMNH); Homalin(BMNH); Changchang Pani (AMNH). D—Lamsokhang, Nangpoh, Rajapara (BMNH). E—Bishenpur, Kindat area, Yin (BMNH). F—Nam Yao, Hsipaw area (BMNH); Mandalay area, Mt. Popa (AMNH, BMNH). G—Backan (BMNH, MNHN); Muong Poun (AMNH); Phuqui (BMNH). H—NE of Toungoo, E of Toungoo, SE of Prome (BMNH). I—Huai Ap Nang (FMNH); Mae Nam Ping rapids (Kloss, 1917, p. 247); Pang Nam Un, Dan Sai district (USNM). J—Ban Mae Lamao (FMNH); 28 miles SE of Ban Umphang (AMNH). K—Dak Sut (USNM).



M. fascicularis: a—Ban Mae Na Ree (FMNH). b—Ban Nam Lai Tai (FMNH). c—40–53 miles E of Ban Umphang (AMNH, BMNH). d—Kata Taek (FMNH). e—Ban Tamrong Phato (FMNH). f—Phu Phan (USNM); Phu Quoi (BMNH). g—Con Son (BMNH, USNM). h—Ko Chang, Ko Kram, Ko Kut (USNM). i—Pak Khlong Pran (Kloss, 1917, p. 289). j—Tenasserim area, King Island (BMNH). k—Sullivan Island, St. Matthew Island (BMNH); Pakchan River (AMNH, BMNH); Pak Nam Chumphon (Kloss, 1917, p. 289). l—Ko Phangan (Robinson and Kloss, 1914, p. 131); Ko Samui (BMNH; Robinson and Kloss, 1914, p. 131). m—Trang, Ko Libong (USNM); Ko Tarutao (BMNH, USNM); Pulau Langkawi, Biserat, Penang Island, Ulu Ijok, Telom River, Changkat Mentri (BMNH). n—Pulau Redang (Kloss, 1911, p. 183). o—Pulau Pintu, Kuala Lumpur vicinity (BMNH). p—Pulau Tioman (BMNH, USNM). q—Tanjong Panjair, Pulau Kaban (BMNH); Pulau Pemanggil (USNM); Pulau Awr (BMNH). r—Pulau Tinggi (BMNH). s—Punggol-Changi (BMNH); Pulau Karimon (BMNH, USNM); Pulau Durian-Pulau Sugi (Sody, 1949, Table 1; USNM); Pulau Bulan, Pulau Batam (BMNH); Pulau Garlang-Pulau Nguwal (Chasen, 1925, p. 93); Pulau Bintan (BMNH, USNM); Pulau Mapur (Robinson, 1916, p. 62).

Open circles indicate marginal locality records without external measurements of adults or subadult, as follows: *M. mulatta*: BURMA—NE of Akyab (Anderson, 1878, p. xviii); NORTH VIETNAM—Vinh Linh vicinity (Dao Van Tien, 1962, p. 724). *M. fascicularis*: BURMA—Arakan (Khajuria, 1954, p. 109),

Continued on p. 30

in nine crab-eating macaques collected in Mindanao, Philippine Islands, about 2,000 km. east of the area studied, relative tail length varies from 1.02 (USNM 125322 ♀) to 1.32 (FMNH 56491 ♂).

Conspicuous exceptions to the general discontinuity of relative tail length in rhesus and crab-eating macaques are evident in three series of three specimens each collected at (1) Dak Sut, South Vietnam, (2) Ban Mae Na Ree (Plate IV, a), and (3) Nam Mae Wong, Thailand (fig. 3, Table 10), all on the border between the ranges of these two monkeys. Pelage color in the Dak Sut series is rhesus-like, but somewhat drabber than usual. In two Dak Sut females the dorsal surface is gray washed with yellowish anteriorly, becoming more golden posteriorly; in one subadult male the dorsal surface is darker grayish-brown washed anteriorly with yellowish and becoming almost imperceptibly brighter posteriorly. Pelage color in the Ban Mae Na Ree series and in the Nam Mae Wong series is more nearly as in typical crab-eating macaques, ranging from golden brown anteriorly, becoming slightly brighter posteriorly (FMNH 99658), to more or less uniformly pale yellowish brown (FMNH 99659) or uniformly darker yellowish brown (FMNH 99657). Pelage color in two of the Nam Mae Wong specimens was described in detail previously (Fooden, 1964, p. 363). Cranially, all three of these series have the rostrum relatively long and narrow as in typical *M. fascicularis*.

In Thailand, crab-eating macaques with normal tail proportions have been collected very near to and interspersed between the two localities where aberrantly short-tailed series have been taken. These two localities, Mae Na Ree (16°25′N) and Nam Mae Wong (15° 55′N), are only about 50 km. apart, yet at Ban Nam Lai Tai (16° 10′N), almost exactly midway between them, five normal subadult and adult crab-eating macaques (relative tail length 0.96–1.22) were collected (Plate IV,b). Similarly, three subadults and adults taken at Kata Taek (15°28′N), about 50 km. south of Nam Mae Wong, also have normal tail proportions (relative tail length 0.94–1.18).

Crab-eating macaques with relatively short tails also have been collected at two other localities along the border between the ranges of *M. mulatta* and *M. fascicularis*. In a subadult female (USNM

Figures 2 and 3 *continued*.

Elephant Point (Anderson, 1881, p. 63), Pegu district (Blanford, 1891, p. 22), Haungtharaw (Khajuria, 1954, p. 108); THAILAND—Ban Phu Toei (FMNH); Lat Bua Khao (USNM); LAOS—Plateau Bolovens (AMNH); SOUTH VIETNAM—Ban Me Thuot (FMNH); Sontra Peak (USNM).

TABLE 10.—External measurements in three series of macaques with relative tail lengths intermediate between those in typical rhesus and crab-eating macaques.

Specimen No.	Sex	Age	Head and body length (mm.)	Tail length (mm.)	Relative tail length
Dat Sut (700 m.), January, 1961, Collected by B. Feinstein					
USNM 320780	♀	adult	462	298	0.64
USNM 320781	♀	adult	401	289	0.74
USNM 320782	♂	subadult[1]	435	322	0.74
Ban Mae Na Ree (about 150 m.), March, 1967, Collected by J. Fooden					
FMNH 99657	♂	adult	448	381	0.85
FMNH 99658	♀	adult	424	334	0.79
FMNH 99659	♀	adult	407	390	0.96
Nam Mae Wong (1,000 ft., 800 ft.), February, 1924, Collected by A. S. Vernay					
AMNH 54677[2]	♀	adult	400	385	0.96
AMNH 54679[3]	♀	adult	460	350	0.76
BMNH 24.9.2.8[2]	♂	adult	470	380	0.81

[1] Incompletely erupted canines and third molars.
[2] Collected 40 miles east of Ban Umphang.
[3] Collected 53 miles east of Ban Umphang.

356968) collected in September, 1967 at Sontra Peak (about 240 m.), South Vietnam, relative tail length is about 0.80, judging from the dry skin; although field measurements of the specimen indicate a relative tail length of 0.60 (total length 615 mm., tail length 230 mm.), these measurements appear to be unreliable. In two infants collected in January, 1932 at Plateau Bolovens, Laos, relative tail length is 0.76 (AMNH 87266 ♀; total length 492 mm., tail length 212 mm.) and 1.17 (AMNH 87270 ♂; total length 530 mm., tail length 286 mm.).

It now seems clear that macaque populations morphologically intermediate between typical *mulatta* and *fascicularis* are restricted to a very narrow altitudinal and latitudinal zone in the Indo–Chinese Peninsula. In this narrow zone the known occurrence of morphological intermediates is further restricted to small, discontinuously distributed local areas. This thin and spotty distribution of intermediates suggests that rhesus macaques and crab-eating macaques are not fully or freely interbreeding, hence not conspecific. The most reasonable interpretation of local morphological intergradation between *M. mulatta* and *M. fascicularis* now seems to be that the intergrade populations are hybrids that have resulted from secondary contact and occasional fertile breeding between two species that previously differentiated in geographic isolation (cf. Mayr, 1963, p. 369).

Speculation that *M. mulatta–M. fascicularis* intermediates represent interspecific hybrids was previously offered by Hill (1964, p. 8), Bernstein (1966, p. 1,559), and Kuhn (1967, p. 30).

Macaca mulatta (Zimmermann). Rhesus Macaque.

Cercopithecus (*Mulatta*) Zimmermann, 1780, p. 195.

Specimens collected.—TAK: Ban Mae Lamao, 1 (skeleton); Huai Ap Nang, 1 (skeleton); Huai Kwang Pah, 2 (1 in alcohol).

Measurements.—See Table 7.

Habits and habitats.—The specimen collected at Ban Mae Lamao, a mature lactating female, was in a troop of about 20 individuals about 20 m. above the ground in a grove of bamboo. The Huai Ap Nang specimen was a solitary male—mature but not senile, judging from tooth wear—encountered about 50 m. above the ground in an evergreen tree. Two immature specimens collected at Huai Kwang Pah were in a large troop estimated to contain 50 individuals. When first encountered this troop was less than 20 m. above the ground in a grove of bamboo; it subsequently fled to about 40 m. above the ground in the leafless canopy of nearby deciduous trees.

Stomach contents in all three specimens examined appears to consist exclusively of fruit pulp and seeds. No insect parts or other animal remains are discernible. However, the cheek pouches of one of these monkeys (Ban Mae Lamao) contained fragments of the eggshell of a small passerine bird, in addition to several large flat bean-like seeds. Six large parasitic nematodes, up to 5 cm. long and 3 mm. in diameter, were extracted from the stomach of one specimen (Huai Kwang Pah).

A large pinkish tumor-like skin growth was present on the head and shoulder of the female collected at Ban Mae Lamao. The thick, hairless growth extended from the right cheek to the right axilla, passing over the right side of the neck and in front of the right shoulder.

Remarks.—See under *M. fascicularis* (above).

Macaca nemestrina (Linnaeus). Pigtail Macaque.

[*Simia*] *Nemestrina* Linnaeus, 1766, p. 35.

Specimens collected.—KANCHANABURI: Ban Kerng Chada, 4; Chongkrong, 1; Ban Huai Maenam Noi, 7 (1 in alcohol). UTHAI THANI: Samnak Rabam (10 km. SE), 2. KAMPHAENG PHET: Ko Keow, 1; Ban Pong Nam Ron (8 km. W), 3 (2 skeletons); Ban Pong Nam Ron (10 km. NW), 1; Ban Pong Nam Ron (12 km. W), 2.

TABLE 11.—External measurements in adult specimens of *Macaca assamensis* and *Macaca nemestrina*.

Locality[1]	Females			Males		
	Head and body (mm.)	Relative tail length[2]	Weight (kg.)	Head and body (mm.)	Relative tail length[2]	Weight (kg.)
Macaca assamensis						
Mae Lamao (**4**)	440,[3]523	0.49,0.39	5.9,[3]6.8	—	—	—
Pong Nam Ron (**5**)	443,[3]482,492	0.50,0.42,0.43	4.58,[3]6.2,6.6	485,[4]538	0.52,0.44	6.1,[4]8.7
Muang Baw Ngam (**15**)	463	0.47	4.86	555	0.35	8.5
Chongkrong (**16**)	—	—	—	476	0.40	6.3
Macaca nemestrina						
Pong Nam Ron (**5**)	473	0.35	5.48	—	—	8.5
Samnak Rabam (**11**)	432	0.38	4.71	—	—	—
Kerng Chada (**13**)	423[3]	0.34	3.85[3]	514	0.40	8.1
Maenam Noi (**18**)	448,484,488	0.40,0.33,0.35	4.65,4.96,4.40	—	—	—

[1] Figures in boldface type are locality numbers shown in map, Figure 1.
[2] Tail length ÷ head and body length.
[3] Subadult, last molars incompletely erupted.
[4] Subadult, canines not quite fully erupted.

TABLE 12.—Field observations of troop size and habitats in *Macaca nemestrina*.

Date (1967)	Locality	Estimated number in troop	Kind of tree in which observed	Estimated height above ground (m.)
Jan. 28	Chongkrong	1	evergreen	45
Feb. 5	Kerng Chada	12	evergreen	15
Feb. 5	Kerng Chada	20+	evergreen	40
Feb. 5	Kerng Chada	30+	evergreen	35
Feb. 16	Maenam Noi	20	deciduous (*Xylia kerrii*)	20
Feb. 26	Samnak Rabam (10 km. SE)	20	evergreen	20
March 9	Ko Keow	—	—	—
April 12	Pong Nam Ron, 10 km. NW	40	evergreen	40
April 20	Pong Nam Ron, 8 km. W	15	evergreen	40
April 21	Pong Nam Ron, 12 km. W	—	—	—
April 21	Pong Nam Ron, 8 km. W	20	evergreen	30
April 23	Pong Nam Ron, 8 km. W	—	—	—

Measurements.—See Table 11.

Habits and habitats.—Eight of nine troops of *M. nemestrina* for which habitat notes were recorded were in evergreen trees about 15–45 m. above the ground; one troop encountered was in deciduous trees about 20 m. above the ground (Table 12). Observed troop size varied from about 12 to 40, and one subadult male (canines and third molars erupting) was solitary. Although stomach contents consists predominantly of fruit pulp and seeds, fragments of caterpillars and adult insects were present in the stomachs of six of seven specimens examined.

Five of seven sexually mature females collected were either pregnant or lactating (Table 13). Three females collected on February 16 were lactating; two of these were taken with infants that probably were born in the preceding December or January. Two observed pregnancies—an early pregnancy in February and a late pregnancy in April—probably would have terminated in June or July. Two non-lactating, non-pregnant females with apparently mature reproductive organs (Table 13, FMNH 99674, 99687) were dentally immature.

In a mature female collected southeast of Samnak Rabam (fig. 1, Loc. No. 11) the nose is asymmetrically cleft (Plate V,a). The underlying nasal bone in this specimen (FMNH 99685) also is asymmetrically deformed.

Remarks.—*M. nemestrina* and *M. assamensis* (see below) are superficially similar in size, relative tail length, and general color

TABLE 13.—Reproductive data in sexually mature females of *Macaca nemestrina*.

FMNH No.	Date (1967)	Dental development	Reproductive condition	Uterus, length × breadth × d-v diam. (mm.)
99674	Feb. 5	M 3 erupting	Not pregnant	35 × 13 × 7
99677	Feb. 16	M 3	Lactating	30 × 15 × 7
99678	Feb. 16	M 3	Lactating, with infant[1]	30 × 14 × 8
99679	Feb. 16	M 3	Lactating, with infant[2]	40 × 20 × 9
99685	Feb. 26	M 3	Pregnant	65 × 30 × 23[3]
99687	April 12	M 2	Not pregnant	30 × 11 × 7
99688	April 20	M 3	Pregnant	140 × 95 × 65[4]

[1] Infant with deciduous second incisors; estimated age 1½ months (Hurme, 1960, p. 796).

[2] Infant with deciduous first incisors; estimated age 1 month (Hurme, 1960, p. 796).

[3] Blastocyst diameter 20 mm.

[4] Sitting height of fetus 150 mm.; estimated conception age 4 months.

(Plate V,b,c; Table 11). These two species may be readily distinguished by the color of the dorsal surface of the tail, which is contrastingly darker than the back in *M. nemestrina* (not in *M. assamensis*) and the clearly defined crown cap present in *M. nemestrina* (absent in *M. assamensis*). In addition, the tail in *M. nemestrina* is less thickly furred than in *M. assamensis*. The glans penis in *M. nemestrina* is bluntly bilobed, approximately as in humans; in *M. assamensis* the distinctive arrowhead-shaped glans penis tapers distally to a narrow vertical crest.

The geographic relationship between *M. nemestrina* in lowland areas of the Indo-Chinese Peninsula and *M. assamensis* in upland areas is generally similar to the relationship between lowland *M. fascicularis* and upland *M. mulatta* (fig. 2). However, the range of *M. nemestrina* extends farther northward than the range of *M. fascicularis*, and in the northern part of its range *M. nemestrina*, unlike *M. fascicularis*, is marginally sympatric with its upland counterpart. There is no evidence of hybridization between *M. nemestrina* and *M. assamensis* at localities where the two species occur together (Plate V,b,c). The sympatry and apparently complete reproductive isolation of *M. nemestrina* and *M. assamensis* indicates that the phylogenetic divergence of this pair of species from one another began earlier or proceeded more rapidly than the divergence of *M. fascicularis* and *M. mulatta*.

The name *Inuus leoninus* Blyth (1863, p. 7; work not seen, citation from Khajuria, 1954, p. 116) with type-locality restricted by

Pocock (1939, p. 60) to N[orth] Arakan, Burma, is available for pigtail macaques in the Indo-Chinese Peninsula. Because they differ externally, cranially, and penially from pigtails in Malaya and Indonesia, subspecific recognition of pigtails in the Indo-Chinese Peninsula is undoubtedly justified and specific recognition is a possibility.

Macaca assamensis McClelland. Assamese Macaque.

Macacus Assamensis McClelland *in* Horsfield [1840], p. 148.

Specimens collected.—KANCHANABURI: Chongkrong, 2; Ban Muang Baw Ngam, 4 (1 skeleton); KAMPHAENG PHET: Ko Keow, 1; Ban Pong Nam Ron (5 km. W), 1; Ban Pong Nam Ron (8 km. W), 3; Ban Pong Nam Ron (25 km. W), 4 (2 skeletons); TAK: Ban Mae Lamao, 3.

Measurements.—See Table 11.

Habits and habitats.—Of 11 *M. assamensis* troops encountered, eight were in evergreen trees 15–50 m. above the ground, two were in bamboo trees 20–25 m. above the ground, and one, for which forest type was not recorded, was about 10 m. above the ground (Table 14). Observed troop size varies from about 10 to 50 individuals. Stomach contents in ten specimens examined consists predominantly of fruit pulp and seeds, although a few insect fragments are present in each of three specimens. The cheek pouch of one adult female (Ban Pong Nam Ron, 8 km. W) contained the severed head of an agamid lizard (*Japalura* sp.).

Seven of nine sexually mature females collected were either pregnant or lactating (Table 15). Of these, four specimens (all just ac-

TABLE 14.—Field observations of troop size and habitats in *Macaca assamensis*.

Date (1967)	Locality	Estimated number in troop	Kind of tree in which observed	Estimated height above ground (m.)
Jan. 15	Muang Baw Ngam	12	evergreen	—
Jan. 17	Muang Baw Ngam	24	evergreen	40–50
Jan. 19	Muang Baw Ngam	20	evergreen	20
Jan. 20[1]	Muang Baw Ngam	20	evergreen	30
Jan. 27	Chongkrong	20	evergreen	15
Jan. 28	Chongkrong	50	evergreen	40
March 8	Ko Keow	30	—	10
March 25	Mae Lamao	25	evergreen	30
April 14	Pong Nam Ron, 25 km. W	10	bamboo	25
April 20	Pong Nam Ron, 5 km. W	10	evergreen (teak)	30
April 23	Pong Nam Ron, 8 km. W	30	bamboo	20

[1] Sight record; no specimens collected.

TABLE 15.—Reproductive data in sexually mature females of *Macaca assamensis*.

FMNH No.	Date (1967)	Dental development	Reproductive condition	Uterine body,[1] breadth × d-v diam. (mm.)
99621	Jan. 15	M 2	Not pregnant, not lactating	14×9
99623	Jan. 19	M 3	Lactating; with infant[2]	—
99628	March 25	M 3	Not pregnant; not lactating	15×11
99629	March 25	M 3 erupting	Pregnant; sitting height of fetus 170 mm.	85×70
99633	April 14	M 3 erupting	Pregnant; sitting height of fetus 140 mm.	90×55
99634	April 14	M 3 erupting	Pregnant; sitting height of fetus 140 mm.	75×50
99635	April 20	M 3 erupting	Pregnant; sitting height of fetus 170 mm.	95×50
99636	April 23	M 3	Lactating	15×9
99637	April 23	M 3	Lactating	14×12

[1] The uterine cervix is peculiarly enlarged in *M. assamensis*; this will be discussed in a subsequent report.
[2] Infant not collected.

quiring last molars) collected between March 25 and April 20 were in late stages of pregnancy. This may indicate an annual birth peak in the period April–June.

Remarks.—See under *M. nemestrina* (above).

Macaca arctoides I. Geoffroy. Bear Macaque.

Macacus arctoides I. Geoffroy [1831], p. 61—for nomenclatural discussion, see Fooden, 1967a, p. 153; 1967b, p. 250.

Specimens collected.—KANCHANABURI: Ban Muang Baw Ngam, 1; Chongkrong, 3.

Measurements.—External measurements of an adult male collected at Ban Muang Baw Ngam are: head and body 524 mm.; tail 51 mm.; weight 10.1 kg.

Habits and habitats.—Two specimens taken at Chongkrong were members of a large band of about 50 individuals that was encountered on the ground in an evergreen forest. In response to gunfire this band fled high into the trees. Another specimen collected at Chongkrong was in a troop of five individuals that also was encountered on the ground in evergreen forest. No habitat notes were recorded for the specimen collected at Ban Muang Baw Ngam. Stomach contents in all four specimens appears to consist exclusively of fruit pulp and seeds. Parasitic nematodes were present in the stomachs of three of the four specimens collected.

Expedition hunters made a careful search for bear macaques at all localities visited. The small number of specimens collected reflects a low incidence of encounters with the species. *M. arctoides* evidently is rarer than other species of primates in the area visited.

Remarks.—The geographic range of *M. arctoides* generally conforms to the upland pattern of distribution previously noted in *M. mulatta* and *M. assamensis.* However, the range of *M. arctoides* extends farther southward—as far as northern Malaya (Medway, 1963, p. 63)—than that of either of the other two upland macaques. This may be related to the fact that *M. arctoides,* unlike *M. mulatta* and *M. assamensis,* has no lowland counterpart.

In a recently published comprehensive study of behavior in *M. arctoides,* Bertrand (1969, p. 3) surmises that this macaque is conspecific with the Chinese stumptail, *M. thibetana.* No evidence is cited in support of this conclusion, which is not based on first-hand study of the Chinese stumptail and which erroneously assumes that *M. thibetana* is restricted to the high mountains of Szechwan (Ber-

trand, 1969, p. 5), although its range actually extends 1,500 km. farther eastward to Kwangtung and Fukien (Mell, 1922, p. 10; AMNH 84472, Chungan Hsien, Fukien; Fooden, 1967a, Fig. 3). The only character, other than those common to the genus, that is known to be shared by *M. arctoides* and *M. thibetana* is the vestigial tail, a character that has evolved several times in macaques (*M. arctoides, M. fuscata, M. maura, M. sylvana, M. thibetana*). *M. arctoides* and *M. thibetana* are much more strongly differentiated than *M. arctoides* and *M. fuscata* (the Japanese stumptail), the latter two of which Bertrand (1969, p. 6) treats as separate species. *M. arctoides* and *M. thibetana* differ strikingly in 1) color and texture of the pelage, 2) color of the face, 3) extent of the naked facial skin, 4) morphology of the skull, and 5) structure of the glans penis and baculum (Fooden, 1967a, p. 160; Dobroruka, 1967, figs. 1–4; Bertrand, 1969, p. 3). There is no indication of intergradation or interbreeding in specimens of *M. arctoides* and *M. thibetana* collected in Kwangtung, China, where their ranges are contiguous or marginally overlapping (Mell, 1922, p. 10, pl. 1–2). Unless evidence of intergradation is discovered, it seems appropriate to continue to regard these two sharply differentiated stumptail macaques as separate species.

Presbytis cristatus (Raffles). Silvered Leaf Monkey.

Simia cristata Raffles, 1821, p. 244.

Specimens collected.—KANCHANABURI: Ban Kerng Chada, 4; Ban Tamrong Phato, 3; Ban Huai Maenam Noi, 4.

Measurements.—See Table 16.

Habits and habitats.—All five troops encountered of *P. cristatus* were in evergreen forest. Four troops were high in the trees, about 40–50 m. above the ground, and the fifth was about 15 m. above the ground. The estimated number of individuals in each of these five troops was: 9, 10, 12, 24, 30. All stomachs examined appear to contain only leaf pulp. The volume of stomach contents in mature specimens is impressive, ranging from about 500 to 775 ml.

Of four sexually mature females examined in the period February 12–15, one was lactating and collected with an infant probably born in the preceding December, two were pregnant and probably would have delivered in April or May, and one was neither pregnant nor lactating (Table 17). The non-pregnant, non-lactating female was dentally immature.

TABLE 16.—External measurements in adult specimens of *Presbytis*; figure in italics indicates number of specimens, where more than three.

Locality[1]	Females			Males		
	Head and body (mm.)	Relative tail length[2]	Weight (kg.)	Head and body (mm.)	Relative tail length[2]	Weight (kg.)
Presbytis phayrei						
Mae Nam Ping (**2,3**)	508,529	1.44,1.54	6.8,5.78	547	1.44	8.7
Mae Lamao (**4**)	451,520	1.65,1.36	5.6,6.4	—	—	—
Pong Nam Ron (**5**)	—	—	—	524	1.33	8.3
Kata Taek (**10**)	480(466–490)*4*	1.63(1.53–1.72)*4*	6.2(5.8–6.7)*4*	—	—	—
Muang Baw Ngam (**15**)	494(474–510)*4*	1.46(1.31–1.56)*4*	6.3(6.0–6.8)*4*	501	1.32	6.3
Chongkrong (**16**)	507	1.50	6.6	506,513	1.43,1.40	6.1,7.4
P. cristatus						
Kerng Chada (**13**)	—	—	—	524	1.40	7.1
Tamrong Phato (**14**)	494,496	1.48,1.58	5.7,5.7	—	—	—
Maenam Noi (**18**)	465,471	1.20,1.60	4.55,5.25	—	—	—

[1] Figures in boldface type are locality numbers shown in map, Figure 1.

[2] Tail length ÷ head and body length.

TABLE 17.—Reproductive data in sexually mature females of *Presbytis cristatus*.

Date (1967)	FMNH No.	Dental development	Reproductive condition	Uterus, length × breadth × d-v diam. (mm.)
Feb. 12	99705	M 3	Pregnant[1]	150×75×55
Feb. 12	99706	M 3	Pregnant[2]	120×55×20
Feb. 12	99707	M 3 and C erupting	Not pregnant	30×15×6
Feb. 15	99708	M 3	Lactating; with infant[3]	45×18×6

[1] Sitting height of fetus 140 mm., tail length 260 mm.; estimated conception age 3 months.

[2] Sitting height of fetus 85 mm., tail length 130 mm.; estimated conception age 2 months.

[3] Female infant, buffy pelage, deciduous M 1 erupting; estimated age 2 months.

Remarks.—Dorsal pelage color is dark brownish-gray to blackish in adult specimens collected of *P. cristatus* and pale buffy-gray in adult specimens of *P. phayrei* (see below). *P. cristatus* in western Thailand lacks the large sharply defined whitish mouth patch that is conspicuous both in *P. phayrei* (Plate VI,a), its neighbor to the north, and *P. obscurus*, its neighbor to the south.

Judging from known collecting localities, the range of *P. cristatus* in western Thailand and eastern Burma extends northeast only to the edge of the Dawna Range. Three localities recorded in the present report, all along Mae Nam Khwae Noi between the Dawna Range and the Bilauktaung Range, define the eastern boundary of the known range of the species. Thai specimens of *P. cristatus* collected by K. G. Gairdner that are listed by Pocock (1935, p. 953) were obtained in the immediate vicinity of Ban Huai Maenam Noi, one of the localities included in the present report. Burmese specimens of *P. cristatus* listed by Pocock (1935, p. 953) were collected at Ye Forest (approx. 15°29′N, 97°55′E) and Nwalabo Taung (13°54′N, 98°30′E), both of which are southwest of the Dawna Range.

In the interior of the Dawna Range *P. cristatus* evidently is replaced by *P. phayrei* (see below). Judging from 43 specimens collected at ten localities (Table 1), these two species of langurs are allopatric, and no other species of langur apparently occurs at any of the localities visited. Present evidence does not support earlier suggestions (Pocock, 1939, p. 146; Ellerman and Morrison-Scott, 1951, p. 204) that as many as four species of langurs—*P. cristatus* (=*Trachypithecus pyrrhus atrior*: Pocock), *P. phayrei*, *P. obscurus*, *P. femoralis*—are sympatric in this area.

If subspecific distinction of *P. cristatus* in western Thailand and eastern Burma from eastern and southern populations of the species is justified, the name [*Pithecus pyrrhus*] *atrior* Pocock (1928, p. 673), with type-locality Ye Forest, Burma, is available.

TABLE 18.—Reproductive data in sexually mature females of *Presbytis phayrei*.

Date (1967)	FMNH No.	Dental development	Reproductive condition	Uterus, length × breadth × d-v diam. (mm.)
Jan. 13	99694	M 3	Lactating	30 × 19 × 7
Jan. 13	99695	M 3	Not pregnant	30 × 15 × 6
Jan. 13	99696	M 3	Not pregnant	35 × 21 × 9
Jan. 14	99697	M 3	Lactating	80 × 40 × 26[1]
Jan. 27	99700	M 3	Not pregnant	40 × 19 × 9
March 18	99725	M 3	Not pregnant	35 × 18 × 8
March 21	99729	M 3	Lactating	35 × 17 × 8
March 29	99733	M 3	Lactating; with infant[2]	—

[1] No blastocyst grossly visible in uterine cavity; probably an early stage in postpartum involution.

[2] Infant FMNH 99734, estimated age 1 month; see Table 19.

Presbytis phayrei Blyth. Phayre's Leaf Monkey.

Presbytis Phayrei Blyth, 1847, p. 733.

Specimens collected.—KANCHANABURI: Ban Muang Baw Ngam, 5 (1 skeleton); Chongkrong, 3. UTHAI THANI: Kata Taek, 11. KAMPHAENG PHET: Ko Keow, 1; Ban Pong Nam Ron, 1. TAK: Ban Mae Lamao, 6; Huai Wang Kwao, 3; Huai Kwang Pah, 2.

Measurements.—See Table 16.

Habits and habitats.—All ten troops of *P. phayrei* for which field notes were recorded were encountered in evergreen forest. Four troops were very high in the canopy, about 40–50 m. above the ground; six troops were about 15–30 m. above the ground. The estimated number of individuals in each of these ten troops is: 3, 5, 6, 10, 10, 10, 20, 20, 30, 30. Stomach contents in all specimens examined appear to consist exclusively of leaf pulp. In mature specimens the volume of stomach contents varies from about 500 to 775 ml.

TABLE 19.—Developmental data in infants of *Presbytis phayrei*.

Date (1967)	FMNH No.	Sex	Dental development	Pelage	Estimated age in months
Feb. 28	99721	♂	Dec. M 2 erupting	Buffy→gray	5
Feb. 28	99722	♀	Dec. M 2 erupting	Buffy→gray	5
March 18	99728	♂	Dec. M 2 erupting	Buffy→gray	5
March 29	99734	♂	Dec. I 2 erupting	Buffy	1

Reproductive tracts were examined in 7 of 14 sexually mature females collected (Table 18). None of these seven was pregnant. Four infant specimens of *P. phayrei* lack permanent molars and therefore presumably are less than one year old (Table 19). These infants probably were born in the preceding September (2 infants), October (1 infant), and February (1 infant). Although the data are meager, the absence of pregnancies in seven female specimens examined of *P. phayrei* contrasts strikingly with the 50 per cent incidence of pregnancies in four specimens of *P. cristatus* collected during the same period (Table 17). This and the apparent discrepancy between these species in probable months of birth inferred for fetuses and infants may indicate that *P. phayrei* and *P. cristatus* have different breeding seasons in western Thailand (Table 4).

Remarks.—Examination of specimens collected of *P. phayrei* reveals that Pocock's (1939) otherwise excellent key and discussion are misleading in two respects concerning this species. The white eye ring may be incomplete medially in *P. phayrei* (Plate VI,a); this condition is not restricted to *P. obscurus*, as indicated by Pocock (1939, p. 138). Color of the pubic region is sexually dimorphic in *P. phayrei* (Plate VI,b), as in *P. cristatus* (*Trachypithecus pyrrhus atrior*: Pocock); Pocock's (1939, p. 121) key incorrectly implies that females of *P. phayrei* lack the distinctive pale pubic patch.

Geographic interrelationships of *P. phayrei* and *P. cristatus* are discussed in the account of *P. cristatus* (above). If subspecific distinction of western Thai *P. phayrei* from northern populations of the species is justified, the name *Presbytis crepuscula* Elliot (1909, p. 271), with type-locality Mulayit Taung, Burma (near the Thai-Burmese border), is available.

Hylobates lar (Linnaeus). White-handed Gibbon.

Homo lar Linnaeus, 1771, p. 521.

Specimens collected.—KANCHANABURI: Ban Tamrong Phato, 2; Chongkrong, 4 (1 in alcohol, 1 skeleton); Ban Muang Baw Ngam, 4 (1 in alcohol); Ban Kerng Chada, 1. UTHAI THANI: Kata Taek, 4. KAMPHAENG PHET: Ko Keow, 1; Khlong Tawai (approx. 10 km. NW of Ko Keow), 2; Ban Nam Lai Tai, 1; Ban Pong Nam Ron, 3. TAK: Ban Mae Lamao, 3; Huai Kwang Pah, 2 (1 in alcohol). MAE HONG SONG: Mae Sariang (30 km. E), 2.

Measurements.—See Table 20.

Habits and habitats.—All 19 gibbon groups encountered were in evergreen forest. Of these, 13 groups were about 20 m. above the

TABLE 20.—External measurements in adult specimens of *Hylobates lar*.

Locality[1]	Females		Males	
	Head and body (mm.)	Weight (kg.)	Head and body (mm.)	Weight (kg.)
Kwang Pah (**3**)	442	4.50	—	—
Mae Lamao (**4**)	—	—	462	6.0
Pong Nam Ron (**5**)	442	5.55	411[2]	3.53[2]
Nam Lai Tai (**7**)	—	—	440	5.2
Ko Keow (**8**)	377,[3] 438	3.62,[3] 5.7	447, 467	6.1, 5.8
Kata Taek (**10**)	438	4.5	435, 450	4.97, 5.65
Kerng Chada (**13**)	—	—	416[2]	4.47[2]
Tamrong Phato (**14**)	428	4.60	438	5.88
Muang Baw Ngam (**15**)	420	4.4	432	—
Chongkrong (**16**)	440	4.6	446, 447	5.4, 6.2

[1] Figures in boldface type are locality numbers shown in map, Figure 1.
[2] Subadult, canines not quite fully erupted.
[3] Subadult, canines half erupted.

ground, three groups were 30–40 m. above the ground, and one group was about 60 m. above the ground; height observations were not recorded for two groups. In 14 troops the number of individuals per troop ranged from two to five, as follows: five troops of two; three troops of three; four troops of four; two troops of five. Three larger gibbon groups (one of seven individuals; one of about 10 individuals; one of about 15 individuals) also were observed, but these probably represent transient encounters between two or more troops with partly overlapping territories (Ellefson, 1967, p. 30). The color composition of gibbon troops observed during the expedition is reported in detail in a general article on color-phase in gibbons (Fooden, 1969, p. 632).

Stomach contents in specimens examined appears to consist exclusively of fruit pulp and seeds. Food fragments in the stomachs of gibbons are coarser than in other primates collected. Some pieces of fruit in gibbon stomachs measure $3 \times 2 \times 1.5$ cm. (FMNH 99760), about twice the dimensions of the largest fragments noted in other primates. Gibbons evidently chew their food less thoroughly than macaques and langurs (cf. Carpenter, 1940, p. 86; Ellefson, 1967, p. 103).

Six of eight sexually mature females examined were lactating (Table 21). Five of these were observed with young infants: four infants were collected. These ranged in age from about one to 12 months. None of these eight sexually mature females was pregnant, judging from gross examination of the uteri.

TABLE 21.—Reproductive data in sexually mature females of *Hylobates lar*.

Date (1967)	FMNH No.	Dental development	Reproductive condition	Uterus, length × breadth × d-v diam. (mm.)
Jan. 15	99736	M 3, C	Lactating, with infant[1]	26 × 17 × 10
Jan. 27	99741	M 3, C	Lactating, with infant[2]	28 × 17 × 9
Feb. 10	99745	M 3, C	Not lactating, not pregnant	24 × 19 × 9
Feb. 28	99747	M 3, C	Lactating with infant[3]	(>14) × 18 × 6
March 7	99751	M 3, C	Lactating	25 × 20 × 5
March 8	99752	M 3; C erupting	Not lactating, not pregnant	24 × 17 × 10
March 29	99757	M 3, C	Lactating, with infant[4]	—
April 10	99760	M 3, C	Lactating, with infant[5]	28 × 18 × 12

[1] Infant FMNH 99737, deciduous I 1–2, estimated age 2 months.
[2] Infant FMNH 99742, deciduous I 1 erupting, estimated age 1 month.
[3] Infant FMNH 99746, deciduous M 2, estimated age 1 year.
[4] Infant FMNH 99758, deciduous M 1, estimated age 3 months.
[5] Infant not collected.

In pale-phase gibbon skins collected, the terminal third of most hairs is speckled with minute black spots. Under the microscope these dark bodies appear to be colonies of the fungal infection black piedra.

Remarks.—Gibbons in northern Thailand, hitherto included in *H. lar entelloides* I. Geoffroy, 1842 (p. 717; type-locality Malay Peninsula, 12°N) recently have been allocated to a newly proposed subspecies, *H. lar carpenteri* Groves, 1968 (p. 625; type-locality Doi Inthanon, Thailand). The geographic range of the proposed new subspecies in northern Thailand is said to extend southwest as far as Doi Inthanon (18°35′N, 98°28′E), and the range of redefined *entelloides* in southern Burma and Thailand is said to extend north as far as Myawadi, Burma (16°41′N, 98°31′E). Accordingly, of 11 gibbon localities reported in the present paper, eight are in the range of redefined *H. lar entelloides* (fig. 1, Loc. No. 5, 7, 8, 10, 13–16), and three (Loc. No. 1, 2, 4) are in the postulated zone of intergradation of *carpenteri* and redefined *entelloides* (Groves, 1968, p. 626).

In the original description of *carpenteri*, this subspecies is distinguished from redefined *entelloides* on the basis of three pelage characters, as follows: 1) dark-phase darker in *carpenteri* ("very dark chocolate brown") than in *entelloides* ("dark brown"), pale-phase paler in *carpenteri* ("creamy-white") than in *entelloides* ("honey-coloured"); 2) base of dorsal hairs paler than tip in *carpenteri* (both color phases), base and tip approximately uniformly colored in *entelloides*; 3) interscapular hair length 79–103 mm. in *carpenteri*, 29–56 mm. in *entelloides*. These diagnostic characters were derived

TABLE 22.—Color and hair length variation in 27 *Hylobates lar* specimens collected.

Rank in pale-dark series	FMNH No.; sex	Age	Interscapular hair length (mm.)	Loc. No.[1]	Hypothetical identification based on locality[2]
		Pale-phase			
1 (whitish)	99759 ♂	adult	65	7	*entelloides*
2	99741 ♀	adult	80	16	*entelloides*
3	99761 ♂	subadult	75	5	*entelloides*
4	99763 ♂	adult	80	1	*car.-ent.*
5	99764 ♀	adult	85	1	*car.-ent.*
6	99756 ♂	subadult	75	4	*car.-ent.*
7	99752 ♀	subadult	65	8	*entelloides*
8	99744 ♂	adult	85	14	*entelloides*
9	99745 ♀	adult	50	14	*entelloides*
10	99743 ♂	subadult	60	13	*entelloides*
11	99739 ♂	adult	80	16	*entelloides*
12	99749 ♂	adult	80	10	*entelloides*
13	99753 ♂	adult	60	8	*entelloides*
14	99748 ♂	adult	70	10	*entelloides*
15	99738 ♂	adult	50	15	*entelloides*
16	99740 ♂	adult	55	16	*entelloides*
17 (cinnamon)	99760 ♀	adult	80	5	*entelloides*
		Dark-phase			
1 (pale chocolate)	99754 ♂	infant	85	4	*car.-ent.*
2	99755 ♂	adult	70	4	*car.-ent.*
3	99747 ♀	adult	70	10	*entelloides*
4	99757 ♀	adult	60	3	*car.-ent.*
5	99751 ♀	adult	70	8	*entelloides*
6	99750 ♂	adult	60	4	*car.-ent.*
7	99762 ♀	juvenile	85	5	*entelloides*
8	99746 ♂	infant	35	10	*entelloides*
9 (blackish)	99736 ♀	adult	75	15	*entelloides*

[1] Locality numbers as in map, Figure 1.

[2] Notation *entelloides* indicates that collecting locality is in postulated range of redefined *H. l. entelloides*; notation *car.-ent.* indicates that collecting locality is in postulated zone of intergradation of *H. l. carpenteri* and redefined *H. l. entelloides* (Groves, 1968, p. 626).

from study of 163 skins assigned to *carpenteri* and an unspecified number assigned to *entelloides* (Groves, 1968, p. 626).

The evidence of 26 dry skins in the present collection (Table 22) indicates that *carpenteri* and *entelloides* are less distinct than originally postulated. Dorsal pelage color in 17 pale-phase specimens varies more or less continuously from whitish to cinnamon, and dorsal color in nine dark-phase specimens varies from pale chocolate to blackish. In specimens of both color-phases collected at localities

within the geographic range assigned to redefined *entelloides*, the range of individual variation includes diagnostic pelage colors of both *carpenteri* and redefined *entelloides*. In the postulated zone of intergradation of *carpenteri* and *entelloides*, pale-phase and dark-phase specimens average slightly paler than those collected in the range of redefined *entelloides*.

Basal and distal portions of the dorsal hairs are approximately uniformly colored in all 17 pale-phase specimens collected. In two of nine dark-phase specimens the bases of dorsal hairs are pale grayish and the distal portions are contrastingly dark brown; one of these specimens (FMNH 99751 ♀) was collected within the range of redefined *entelloides*, and the other (FMNH 99754 ♂) was collected in the presumptive *carpenteri–entelloides* intergradation zone. In two dark-phase specimens (FMNH 99736 ♀, 99746 ♂) collected in the range of redefined *entelloides* the dorsal hairs are approximately uniformly dark from base to tip. In the remaining five dark-phase specimens the basal portions of dorsal hairs are slightly paler (brownish-gray) than the distal portions (brown).

Interscapular hair length in all but three specimens in the present collection is greater than the maximum postulated for redefined *entelloides*. In nine specimens, collected both in the range of *entelloides* and in the presumptive *carpenteri-entelloides* intergradation zone, interscapular hair length is within the range postulated for *carpenteri*. This character also appears to be highly variable within the geographic range allocated to *carpenteri*; Groves (1968, p. 627) notes that interscapular hair length in one lowland specimen assigned to *carpenteri* is 24 mm. less than the minimum specified for that nominal subspecies. The discrepancies noted above indicate that final determination of the validity and significance of the distinction between *carpenteri* and redefined *entelloides* will require further detailed comparison of more extensive series of specimens.

PLATE I, a. Ban Muang Baw Ngm, evergreen forest on hillside, miners' quarters at base of slope (foreground).

PLATE I, b. Khao Phatowee, about 25 km. west of Uthai Thani, habitat of protected colony of *Macaca fascicularis*.

PLATE I, c. Khao Phatowee, detail view showing vegetation growing on precipices.

PLATE II, a. Lop Buri, part of protected colony of *Macaca fascicularis* on temple ruins.

PLATE II, b. Ban Nam Tai, village and cultivated fields in recent clearing; note relict forest trees within village.

PLATE III, a. Khlong Suan Mak, expedition camp on left bank at base of foothills of Dawna Range.

PLATE III, b. Khlong Suan Mak, mixed evergreen and bamboo forest near camp.

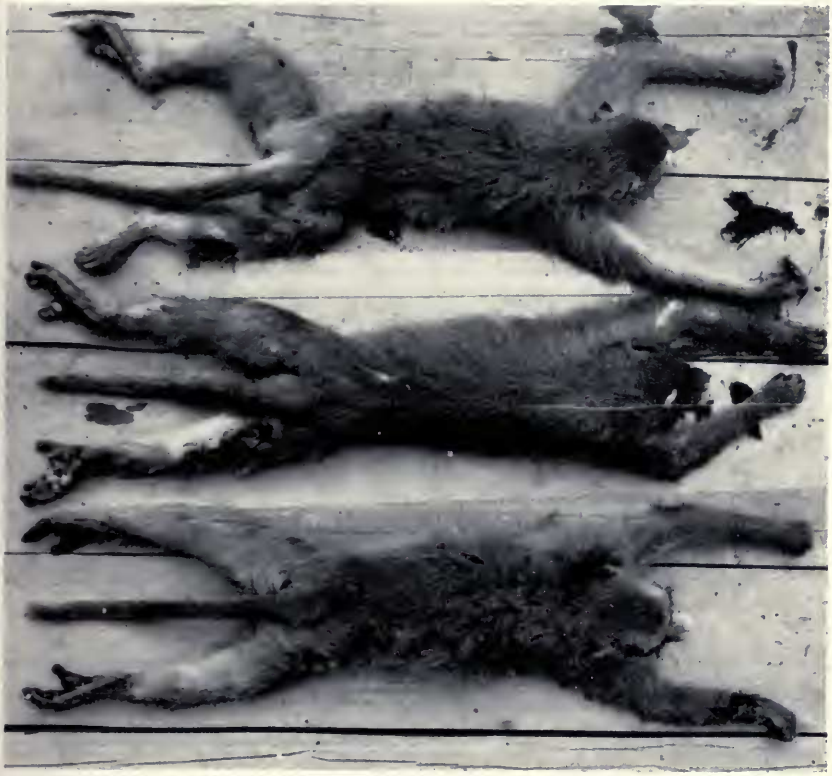


PLATE IV, a. *Macaca fascicularis*, short-tailed series collected at Ban Mae Na Ree.

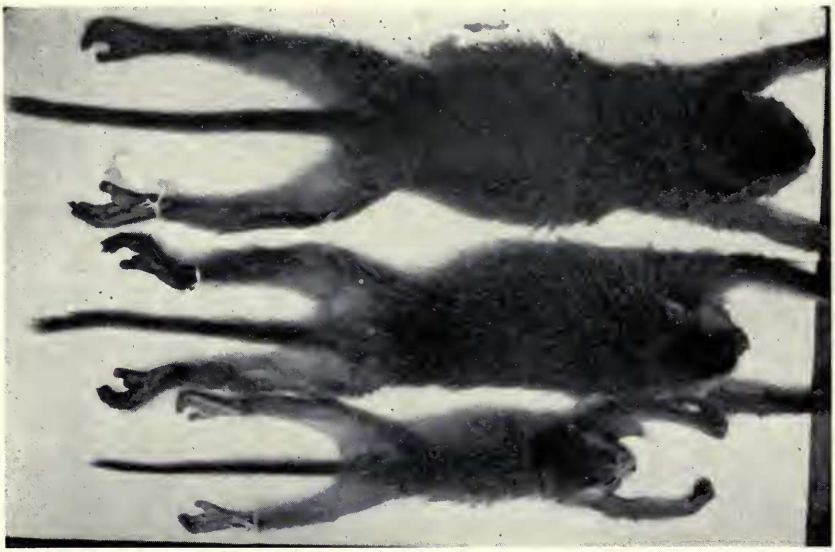


PLATE IV, b. *Macaca fascicularis*, typical long-tailed series collected at Ban Nam Lai Tai, about 50 km. south of Ban Mae Na Ree.

PLATE V, a. *Macaca nemestrina*, cleft nose in female collected 10 km. southeast of Samnak Rabam.

PLATE V, b. *Macaca nemestrina* female collected about 8 km. west of Ban Pong Nam Ron, April 20, 1967.

PLATE V, c. *Macaca assamensis*, female collected about 5 km. west of Ban Pong Nam Ron, April 20, 1967.

PLATE VI, a. *Presbytis phayrei*, male (left) and female (right) collected at Chongkrong; note medially incomplete eye rings.

PLATE VI, b. Sexual dimorphism in *Presbytis phayrei*, female (left, with whitish pubic patch) and male (right) collected at Chongkrong.

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